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DECLARATIONS

Competing interests

The authors declare that they have no competing interests.

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Authors' contributions

PKS contributed to acquisition of data and was a major contributor in writing the manuscript. LMH contributed to acquisition of data and critical revision of the manuscript. RJP contributed to study conception, study design and was a major contributor in writing the manuscript. All authors read and approved the final manuscript.

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Abstract

Health*e*Steps is a pragmatic, evidence-based lifestyle prescription program aimed at reducing the rates of chronic disease, in particular, type 2 diabetes. A process evaluation was completed to assess the feasibility of the implementation of Health*e*Steps in primary care and community-based settings across Canada. Key informant interviews (program providers and participants) were conducted to identify facilitators and barriers to implementation and opportunities for future program adaptation and improvement. Forty-three interviews were conducted across five regions in Canada (15 sites ranging from remote, rural, suburban, and urban). Transcripts were analyzed using a qualitative naturalistic inquiry approach with several facilitating factors identified: pragmatic program design, in-line goals with sites' mandates, and access to ongoing support. Barriers were related to administrative challenges such as booking space, personnel changeovers, and scheduling participants. Findings from this analysis revealed insights on program delivery, design, and importance of site champions. Key lessons learned focused on two areas: infrastructure support and program implementation. The application of these learnings from the Health*e*Steps program may inform the development of strategies that can optimize program adaptation and support while reducing real and perceived barriers experienced, thus increasing the success of translation of the evidence-based diabetes program to different points of care.

Key words: lessons learned, Health*e*Steps program, facilitators, barriers, implementation

Introduction

Obesity has reached epidemic proportions in Canada (Standing Senate Committee on Social Affairs Science and Technology, 2016). Given the increasing prevalence of diabetes worldwide, appropriate and practical prevention and management solutions are critical. The impact of obesity on mortality is alarming with 48,000 to 66,000 deaths per year in Canadians (Standing Senate Committee on Social Affairs Science and Technology, 2016). Particularly concerning is the fact that over 25% of Canadian adults self-reported a height and weight categorizing them as obese (Statistics Canada, 2015). This coincides with the increase in rates of type 2 diabetes, hypertension, stroke, cardiovascular disease, and some forms of cancer (Canadian Institutes of Health Information & Public Health Agency of Canada, 2011; Public Health Agency of Canada, 2016). Clearly, this data elucidates the urgent need to improve health-related outcomes for individuals with obesity and those with type 2 diabetes, and, especially, those afflicted with both.

Many chronic diseases including cardiovascular disease, diabetes and cancer, can be prevented through reducing behavioural risk factors such as physical inactivity and unhealthy eating habits (Hagobian & Phelan, 2013; Statistics Canada, 2014; Warburton, Nicol, & Bredin, 2006). There is evidence that most cardiovascular diseases could be prevented by a coordinated effort to adopt and sustain an active lifestyle through focusing on small changes (Simmons, Unwin, & Griffin, 2010). Comprehensive lifestyle interventions have been found to have positive long-term effects leading to lower risk of type 2 diabetes (Hagobian & Phelan, 2013). Moreover, health coaching interventions where goal setting is utilized may effectively improve lifestyle changes (Olsen & Nesbitt, 2010). However, there is a need to better address barriers to

understand the effectiveness of prevention lifestyle programs (Stoutenberg, Stanzilis, & Falcon, 2015) as there has been a lack representation of experiences from implementation in a wide distribution of "real-world" settings and "everyday" preventative health practice as well as participants' perspectives. This includes different points of care (i.e., family practice, workplace, education institutions, community centers, fitness centers) where patients and health providers interact to improve health. Furthermore, experiences of program delivery focus on primary care (Blonstein et al., 2013; Josyula & Lyle, 2013; Lee, Hillier, & Weston, 2014).

Through our previous research, we found that few physicians prescribed exercise to manage chronic disease (Petrella, Lattanzio, & Overend, 2007) and often lacked specific health promotion tools and training (Petrella et al., 2011; Petrella, Koval, Cunningham, & Paterson, 2003; Petrella & Wright, 2000) for addressing at-risk patient needs. Health*e*Steps was developed from an extensive research base (Foisey, Cook, Intzandt, Stuckey, & Petrella, 2012; Petrella et al., 2011; Petrella, Koval, Cunningham, & Paterson, 2001; Petrella et al., 2003; Petrella, Lattanzio, Demeray, Varallo, & Blore, 2005; Petrella et al., 2007; Petrella & Wright, 2000; Stuckey, Shapiro, Gill, & Petrella, 2013) with the aim of developing a foundation of type 2 diabetes prevention research in the points of care to create healthier communities. The Health*e*Steps program was further assessed through a randomized control trial which targeted physical inactivity, sedentary behaviour, and poor diet through one-on-one coaching, and health technology supports (Gill et al., 2017). The delivery of the Health*e*Steps program in this paper utilized similar goal setting, supports, and objectives (Gill et al., 2017), however sought to further extend our program reach and effectiveness into rural and remote communities.

Rural and remote areas are at increased risk of chronic disease and type 2 diabetes (DesMeules & Pong, 2006). An important determinant of health outcomes for those living in rural and remote communities is their access to health services (Pong et al., 2011; Wilson, Smith, & Humphreys, 2008) and their use of health-related internet supports (Hale, Cotten, Drentea, & Goldner, 2010; Stuckey et al., 2011). To better understand the applicability and acceptability of Health*e*Steps in a range of rural and remote areas, an 8-month trial of the program was conducted across 5 different regions in Canada. The Health*e*Steps program was implemented in 15 sites across 5 regions in Canada in a of range settings: North Eastern Ontario (4 sites; primary care and education institutions), South West Ontario (5 sites; primary care), North West Territories (2 sites; education institutions), North West Ontario (2 sites; workplace wellness initiatives and community center), and British Columbia (2 sites; health and fitness community centre and primary care). We provided role specific training prior to program onset and sought to build multifunctional teams in these sites with diverse functional backgrounds as they bring different and complementary knowledge (Bunderson, 2003) and utilized a centralized research team to the support program implementation across sites. This pragmatic approach was developed to limit costs and access to resources.

The Health*e*Steps program draws upon evidence from diverse areas including physical activity and healthy eating, behaviour change, and knowledge translation. To support long-term lifestyle change, once every two months for an 8-month period, participants were provided one-on-one personalized coaching with a trained Health*e*Steps coach grounded in Motivational Interviewing (Rubak, Sandbaek, Lauritzen, & Christensen, 2005). As a part of the exercise proportion of the program, participants completed a sub-maximal fitness test, the STEP™ test

(Petrella & Wright, 2000). Participants had access to eHealth technology tools to support behaviour change between coaching sessions which included online personal networks and telephone based coaching (Gill et al., 2017). As a follow-up to program completion, we conducted interviews with key informants of the program.

To better our understanding regarding feasibility of delivery and long-term uptake of Health*e*Steps in "real world" settings, this paper explored the facilitators and barriers of program implementation including the research process. While addressing modifiable risk factors has yielded positive results through our research of the Health*e*Steps program in clinically controlled settings, experiences learned through the program's feasibility of implementation has yet to be explored, specifically in rural and remote areas where risk for chronic disease is greatest.

Methods

Individual telephone interviews were conducted with key informants from each region in this study, representing Knowledge Brokers (KBs), coaches, participants, and Key Stakeholders (KSs) such as academic leads and program partners (i.e., management/ leadership from organizations hosting the Health*e*Steps program) (Table 1). Unique interview guides were developed for each of the respondent groups, with the aim of eliciting their unique experiences consistent with their role in the program with questions designed to provide insight in their experience with program implementation. Forty-three interviews were conducted by one author to ensure consistency. Field notes were maintained for all interviews; additionally, all interviews were digitally recorded and transcribed.

Transcriptions were analyzed using a qualitative naturalistic inquiry approach (Lincoln & Guba, 1985). Reoccurring themes were identified through inductive analysis of the data without prior assumptions (Patton, 2002). The analysis reflected the constructivist paradigm, acknowledging multiple perspectives to specific phenomena, generating a thorough understanding of individuals' perceptions of and experience with the program within the context of their role within the program (Denzin & Lincoln, 2008). Two authors reviewed the interview transcripts several times to achieve immersion and gain full understanding of the perspectives of interview participants. An initial review of the transcripts allowed for the generation of broad categories and the identification of emerging themes. Study rigour was ensured during this review of transcripts by another analyst, providing feedback on the coding. Furthermore, additional rigour was achieved by the entire research team providing overall feedback on the themes generated by the analysis. Inter-rater coding served to reduce bias in the identification of emerging themes. Discussions of identified themes among the research team resulted in several iterations of the broad themes and sub-themes to achieve greater clarity of the data (Braun & Clarke, 2006). Ethical permission was approved by the Western University Sciences Research Ethics Board (#105331).

Findings

Key informants identified several facilitating factors towards program implementation: program design, program goals, and access to ongoing support (Table 2). The Health*e*Steps program was found to support both success and sustainability through its pragmatic design and delivery. The design and participant focus within the program was perceived as simple and easy to grasp. The low cost and resource needs facilitated implementation which supports its strength

in its adaptability to different settings, organizations, geographic regions, and populations. The participant-centred focus of the program, in terms of individualizing the program and supports to participant needs and preferences encouraged behaviour change. Participants established goals that were self-relevant and reflected how they lived their lives, a factor that was also perceived as a strength of the program. The focus on self-management and the self-directed focus of the program were perceived as facilitating sustained change in their health behaviours.

A key determinant of program delivery was accountability. This included the relationship developed between the coach and the participant. As evidence of this, when the program was first launched, participants were not assigned a specific coach (they saw a different coach at each visit); high attrition rates were attributed to the lack of a relationship between participants and coaches. However, upon recognition of the importance of matching coaches to participants, each participant was assigned a specific coach halfway through program delivery. This allowed for the development a foundation on which to base future goals and health behaviour changes were made. Also, the participants were more amenable to the research data collection when they had a relationship with the coach. Without this established relationship, participants felt they were there primarily as research participants. As well as participants, dedicated personnel in the roles of the KB and coaches were key to successful delivery. Teams that had committed personnel instilled confidence among participants. Another form of accountability that facilitated the program was the collaborative relationships between KSs and the central research team. For community partners, the program was described as well aligned and consistent with their organization's mission and vision related to wellness and health promotion. Additionally, the use

of evidence-based measurements provided objective, concrete evidence of improvement, which motivated participants to continue with their goals developed through the program.

Knowledge translation was a key factor that facilitated program implementation. Many participants expressed how the program increased their awareness about their health suggesting the length of the program promoted long-term health behaviour changes. Moreover, KSs appreciated that the program provided a training opportunity for students and staff, affording them the opportunity to apply what they had learned in their formal education to practice (real life application). Additionally, the program provided KSs' staff further expertise and confidence when working with patients within and outside the program. Transparency in communication further facilitated collaborative teamwork amongst sites and the central research team. KBs and KSs felt comfortable accessing the central team. Program sites felt that the central research team respected their input and valued their feedback, as evidenced by requests for feedback and enthusiasm to take on suggestions.

Barriers

All but 3 of 15 program sites established and sustained the program over the 8-month period. Several barriers to implementation were identified (Table 3). The sites unable to sustain the program faced many challenges including loss of communication with KBs and limited support, as KSs were geographically distant as well as central research team. Most barriers identified by key informants were primarily related to administrative processes. As this was the first time the program was run within each site, many informants perceived these challenges as resolvable.

While the central research team provided sites with program specific training and worked together with sites and community partners to implement the programs, often, coordinating competing priorities and schedules, managing cancelled sessions, and room availability placed constraints on the coaching sessions. Similarly, technological supports were underutilized and was attributable to several factors: a) competing interests b) introduction of supports too late in the program; c) technological problems. Sites without access to these supports for program launch, resulted in limited interest among participants to engage in this later in the program. Participants were noted to prefer working one-on-one with coaches, with whom they had established a working relationship and wanted to maintain this connection rather than establish a new one.

The implementation of the program was negatively impacted by the additional paperwork and time commitments research requires. Specifically, recruitment and support for the program was challenged by the need for detailed and multiple documentation that was often repetitious. This challenged the retention of participants and coaches in the program due competing priorities. Moreover, implementation of the program posed difficulty with frequent staff and student turnover. Turnover was frequent and often when new personnel came in to take over a role, no formal training was provided which resulted in miscommunication among sites and lack of coach continuity for coach and participant relationships. A barrier found in remote areas was limited funding and human resources. Research completed in areas where availability of personnel or students and funding was limited made it a challenge to recruit coaches for the program. While students were deemed appropriate for coaching role, they also posed challenges

with scheduling and required continual support to ensure training was adhered to and that clear objectives and goals of the program were understood.

Many informants expressed that they lacked support at beginning of program and that objectives were unclear, which led to difficulty with initial program implementation and participant success. The length of time between sessions was found to challenge participants to remain motivated and engaged, contributing to attrition. After the first sessions, many participants withdrew due to lack of interest and momentum in the program. Recognizing that two months between sessions was too long, given that participants were dropping out, one of the regions chose to have coaches connect with participants every few weeks by telephone. It was noted that additional contact with participants helped to maintain momentum in the program.

Key Lessons Learned

Key informants identified several key lessons learned through the implementation of the program (Table 4) in two areas: infrastructure support and program implementation. Sites that experienced success with program implementation often already had infrastructure support (i.e., primary care). Other important facilitating factors included: training (in-person and on-going), additional support at program onset for both participant and implementation team, access to consultation and mentorship through creation of a community of practice (team members who would engage in a process of collective learning), and secure invested interest from the site and its team members to implement the program. While the beginning of program implementation faced its challenges, key informants suggested that with more experience, the logistics of program implementation became more efficient and saw less drop outs of participants.

Participants who expressed satisfaction with the program viewed their relationship with their coach as key to their motivation, to program accountability, and to their ability to change their health behaviours. In fact, many participants expressed this accountability had a ripple effect to other family members. Barriers included ensuring adequate time was allotted for sessions to allow participants and coaches the opportunity to develop rapport; without this established relationship, participants felt their participation was primarily as a research participant. Identified constraints imposed by research protocols that affected the program implementation centered around the need for attention to detail and data collection requirements which resulted in additional paperwork that was often perceived as redundant. Prior to program implementation, data collection methods should have been reviewed with staff and participants to ensure they were inline with the objectives of the program. To facilitate technological uptake, it was suggested that the implementation team provide participants with all available resources and support for the program early in the program and promote this regularly during session visits to encourage uptake and understanding of its use and importance to support behaviour change.

Discussion

We developed Health*e*Steps as an evidence-based, pragmatic lifestyle program to address diabetes prevention and management of diabetes. The participant focused approach of the program allowed for empowerment of participants to make change and through the development of rapport with their coaches, which is an integral component of program implementation (Lewis et al., 2014). Another integral component of the program was that all members of the health care team understood the program objectives and had access to ongoing support and training

throughout program delivery; these types of factors have been identified as important for program efficacy and sustainability in primary care settings (Lee, Hillier, & Weston, 2014).

The Health*e*Steps program supported the development of interprofessional collaborations by requiring teams to work together on a common goal of improving communities' lifestyles, nevertheless a key barrier continually found revolved around administrative processes due to competing interests that often resulted in scheduling issues (Stoutenberg et al., 2015). This reflects similar lessons learned from other programs' experiences (Blonstein et al., 2013; Josyula & Lyle, 2013; Lewis et al., 2014). Specifically, ensuring adequate facilities and space for programming (Blonstein et al., 2013) as well as dedicated health promotion resources that include personnel and materials for implementation (Josyula & Lyle, 2013; Lewis et al., 2014). Moreover, strong multifunctional teams with diverse functional backgrounds were observed as being pivotal towards program implementation, including the role of centralized support to help move the program forward (Bunderson, 2003). The importance of the role of centralized support was often overlooked as local level support was often preferred. This might explain why many informants expressed a lack of initial support at the beginning of program.

Perceived constraints with implementation of the research components included burdensome paperwork and underutilized resources. In many cases, this resulted in a heavier workload for the delivery sites, which restricted the adaptability of the program. Implementation as a community program without research requirements, will allow increased flexibility and support program goals to place less burden on both the implementation team and participants. Consistent with the factors identified, and regardless of site readiness, it was identified that

increased support at the beginning of program implementation was critical. To increase participant adherence and promote long-term success, additional motivational strategies to engage participants may be needed (Blonstein et al., 2013). Adequate and periodic meetings between sites and the central research team may further facilitate successful program implementation to address sites concerns, collaboration, and facilitate learning from different sites' experiences (i.e., communities of practice). This might include a training portal where team members can openly discuss their successes and challenges experienced. While people living in rural areas may be less likely to access internet resources (Hale et al., 2010) to support participants and how technological resources are used, further discussion and its use during one-on-one sessions might further facilitate uptake and decrease participant attrition as the use of education and technology tool supports health changes (Stuckey et al., 2011).

As noted, long-term sustainability of the program requires dedicated and sufficient resources including: financial, personnel, and facility space. Thus, partner organization's invested interest becomes of great importance for the adoption and sustainability of the program with infrastructure support at the site. Encouraged consultation and engagement within the organization can also reinforce salience of participant health behaviour changes (Josyula & Lyle, 2013). The dedication of these resources within the program setting would also decrease participant attrition rates as well as improve access to the program. Clear objectives for program delivery need to be co-created at the beginning to ensure all key informants work as a team towards a common goal and have adequate access to resources.

A program "champion" is noted to improve program adoption (Lee et al., 2014; Shaw et al., 2012). Within the Health*e*Steps program, two key champions facilitated program implementation at each site: a site (KS) and program (KB) champion (See Table 1 for detailed roles). Sites that already had other community health programs in place, when Health*e*Steps was added to the existing program the process was more easily implemented since resources were already in place. Sites where the program was the first community health related initiative, additional infrastructure support needed to be established and resources identified which required more time by the site and program champions prior to implementation. Future research by our team will include program optimization to understand the factors that contribute to longer-term sustainability for both those who implement the program and participants, and knowledge translation efforts to support communities and build capacity.

Study limitations

Selection bias may exist as participants interviewed had all completed the program. While attempts were made to have adequate representation of key informants, not all sites had the same degree of representation from all key informants who started with the program. Additionally, interviews were completed within two months post program completion, thus, we do not have information regarding the long-term impressions of the program.

Conclusion

Our findings of the Health*e*Steps program implementation feasibility in a diverse range of points of care across Canada, highlight the importance of infrastructure support for administrative processes and champions to engage the target populations and their providers.

Within each site, it was observed that establishment of a detailed plan of implementation including necessary logistics and resources needed were critical for successful implementation and completion of the program. The key lessons learned we have observed will inform the optimization, adoption, and sustainability of future Health*e*Steps program delivery among Canadians at risk.

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493 Table 1: Summary of Roles of Key Informants

Role	Responsibilities
Knowledge Broker (KB)	• Liaison (local program and central research team). • Facilitate program implementation (coordinate coaches, schedule appointments and space). • Local data collection.
Coach	• Complete Healthe*S*teps coach training • Implement coaching role with participants (administer fitness tests, assist with goal setting, facilitate use of technological supports).
Participant	• Participate in program (attend sessions with coach).
Key Stakeholder (KS)	*Academic Lead* • Oversee local program to ensure program implemented as intended. • Recruitment of Community Partner, Knowledge Broker, and Coaches *Community Partner* • Decision-making to partner with program. • Support recruitment of participants through assisting with access to onsite resources and staff.

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495 Table 2: Summary of Factors Identified as Facilitators

Facilitator Factors	Supporting Quotes
Program Design	
Pragmatic	*"In the real world it works within an existing work flow quite well. So this isn't something that requires tons of extra resources or hiring of extra personnel. It can be completed by a dietician or a nurse or a physician within their regular work schedule. We have step units that we've built but you can also use any two standardized steps in your office if you don't have that equipment. So it would be very easy to implement in any health organization across Canada."* [KBID#2]
	"This was a vehicle for training students and all of them were very appreciative of having this opportunity and it's going to serve them well…it's that real life application that can't be replaced by any kind of textbook learning, they feel much more comfortable and confident in heading into a work place situation now, having this under their belt." [KSID#1]
Participant Focused	*"…the participant is the expert in their own life, so although we want to communicate the fact that it's important to exercise and reduce sedentary behavior and eat healthy, the participant is the one who knows how that's going to fit into their lifestyle."* [KSID#2]
	"…there was someone holding me accountable, and just the way that it was sort of incremental changes made it easy to, like it wasn't changing my whole life, it was actually one little thing…" [PID#1]
Accountability	*"…participant retention really depends on the one-to-one experience that the participant has with the coach or coaches."* [KSID#5]
	"I think the biggest determinant of those successes have been the regional knowledge brokers, the time that they've committed to actually being available to the coaches and working on implementation. And then the other is the coaches enthusiasm in actually delivering the program. So I think if either one of those two things is low, then you can run into some issues." [KBID#2]

Evidence-Based	*"I think so many people they just get so caught up at looking at the scale and having that be the real indicator for how you're doing…The step test was great because you could see those number change and the VO2 max."* [CID#2]
	"Tools to self-manage I think is crucial… getting the person let's say engaged in actually tracking that stuff so they can see are they improving and then based on that you re-do the step test…" [CID#1]
	"I liked that there was the STEP test throughout so you could actually measure what's changing throughout the program." [PID#12]
Knowledge Translation	*"By the time the program ended I was totally where I wanted to be, I had totally got a new understanding of fueling my body…the program really changed a lot of things for me and even in my lifestyle because it's a lifestyle change."* [PID#2]
	"My main focus is on diet so having HealtheSteps training and cutting my teeth with counseling people more specifically on activity really helped me out." [CID#1]
Program Goals	
Aligned with partner organization's mandate	*"It fits perfectly and it's in our mandate or mission statement…helping people live healthier lives, so it falls perfectly in line with what our [organization] is supposed to be doing."* [KSID#1]
Access to support	
Transparency	*"There was open communication, I felt as though I could ask questions and the team got right back to me… directly getting back to me or through* [academic leads]*, so I felt like I was part of the team and felt like I could ask questions and get clarification if needed."* [KSID#2]

Table 3: Summary of Factors Identified as Barriers

Barriers	Supporting Quotes
Process and Resource-Related	
Scheduling and coordinating	*"It was a bit of a logistical nightmare to do. We were coordinating a staff member, a room booking, and the coach so there was like 3 components to everything, so that was tricky."* [KSID#3]
	"If an appointment was cancelled then we had to rebook, find the coach, find the participants, find a good time, find a room, and so that, that in itself was quite a challenge." [KSID#2]
Technological supports	*"I did go online, but I never really used it and for me the reason I didn't was probably a time element because I work everyday..."* [PID#2]
Paperwork	*"It's a bit of a challenge to have an exercise lifestyle implementation program folded into a research program because the research side of things wants things extremely well documented and accurate and that sometimes takes away from just being able to run with it…"* [KSID#1]
	"What kind of got us blind sided I think is especially with the research people who weren't involved in research its just the inundation with paperwork, duplication, and I felt bad for some of the patients." [CID#1]
Human Resources	"*…we've found that there's a lot of turnover in the health industry especially in Family Health Teams.*" [KBID#2]

Initial Supports	*"…the training should be a little bit more organized and mandatory before you step in… I had to kind of like, you know, have that learning curve where I learned on my own."* [CID#4] *"I certainly think the biggest challenge for me was during the initial stages of the study…I really felt the entire program was left on my shoulders…I felt quite overwhelmed a number of times…As time went on it became easier once I had figured out how to organize things appropriately, but having that support right off the bat while our team was getting used to the program would have been really valuable."* [KBID#4]
Program-Related	
Length of time between coaching sessions	*"I think that initially only meeting every two months or so I think that's too long of a time. It's a gap, especially for those people that are in the early stages of behavior change. I think they need a little bit more support earlier on… I think it might explain some of the drop off that we've had."* [KSID#6] *"…if I met with the coaches more often it would keep me more accountable because a lot can happen in a couple of months."* [PID#10]

Table 4. Key Lessons Learned in the Implementation of a Healthy Lifestyle Program

Infrastructure Support

- Have more supports at a local level to facilitate implementation
- Create a community of practice
- Encourage consultation and engagement
- Ensure needed resources (financial, personnel, and space) are in available
- Requires an invested site and program champion

Program Implementation

- Frontload coaching sessions and ensure adequate time for follow-up visits
- Develop a communication strategy between coaches and participants
- Streamline data collection and tracking tools
- Provide clear objectives and training on program